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The Management of Automation: A Review of the Proceedings of the Data Processing Clinics

INTRODUCTION

The topic for this presentation is the Management of Library Automation as viewed through the twenty-five years of data processing clinic proceedings. In a way, it is a disconcerting topic, because it generates ambivalence: have librarians managed automation, or has it managed librarians? The author's experience suggests that the introduction of new technology stimulates in employees either cynicism or a powerful existential angst. Predictably, the managerial pose that is struck when employees express trepidation concerning new technology is that they (the employees) must adapt; that the key to dealing with automation is (the employees') open-mindedness and flexibility; and that it is their (the employees') defects — mental, emotional, or physical — that threaten the success of automation.

It is not surprising, then, that much of the current management literature, including a recent edition of the proceedings (Shaw, 1985), concentrates on why employees fear and resist technology, and how employers might dispel their misgivings.

To manage is to control, and the library literature on managing automation is one part the literature of controlling the machine and one part the literature of controlling the employee. This latter concern simply recognizes that, to a large extent, the machine has profoundly affected how one manages oneself. Automation changes the tasks and responsibilities of one's job, redefines one's organizational and departmental roles, alters one's work climate, restructures one's fiscal envi-

ronment, and has brought into the workplace new employees whose interests, skills, and language are, to many librarians, peculiar, even bizarre. In the final analysis, the literature of managing automation is divided into the literature of managing the machine and the literature of managing the people.

The balance of this paper is organized into three parts. Each part reviews in chronological order pertinent proceedings from the 1960s, 1970s, and 1980s.

PHASE I. FOCUS ON THE MACHINE

The Proceedings of the 1960s

Very early editions of the proceedings were not concerned with management issues per se; rather, they dealt with characteristics of the automated systems themselves. References to management were at best incidental.

One of the early proceedings (1967) did include two articles on the management of automation. The first was a case study of an automated system (Hage, 1967). It ostensibly covered such topics as consultants' reports, bidding, and staff involvement. In reality, it was a paean to the computer, a uniformly optimistic assessment. This optimism was natural and certainly not uncommon for the day. There was, however, a more discerning article in the same volume on "The Decision to Automate" (Chapin, 1967). Today, the decision whether to automate seems almost quaint, although it may still arise in some library backwaters. Now managers are more often concerned with which system to automate rather than whether to automate. But in Chapin's day (it seems as though this took place in the nineteenth century, rather than merely two decades ago!) the desirability of automation was a legitimate question. What factors did the manager consider in making this decision?

Although managers are seldom drawn to philosophical musings, Chapin did engage in one, more speculative reflection: perhaps, he mused, implementing automation would ultimately lead to the decline of reading and writing. While this was only a rhetorical foreboding, two more tangible problems affected the decision to automate: the costs of automation were uncertain, and the technology had significant deficiencies. (For example, scanners were having difficulty reading different type fonts.) These observations were both practical and central to the management of automation at this time. They focused on the potential liabilities of the machine itself.

Despite these misgivings, Chapin found many reasons for the

manager to consider automation in 1967. These reasons can be grouped into four categories:

1. *The need to cut costs.* The library was already experiencing the inflationary pressures that were to degrade the dollar for a decade, and there was no reason to assume that the costs of materials or labor were heading downward. Similarly, there was little reason to believe that library budget increases would offset these costs.
2. *Increased demands on the part of the users.* The patron was demanding better access to the literature. If the manager's goal was service, then something had to be done to improve it. User frustration was increasing.
3. *The expansion of publications.* The "information explosion" had arrived. Control over the literature of the sciences had become an especially imposing task.
4. *Understaffing.* Libraries had too few employees to provide the needed services. Automation might provide maximum efficiency for the already burdened library work force.

Certainly from a management perspective, Chapin was performing an important function: identifying forces both environmental and internal that affected productivity in the organization and dictated change. When he identified these forces, he provided a fundamental rationalization for the decision to automate.

Of course, identifying the need for a change does not in itself suggest how one changes judiciously. To this end, Chapin provided some general managerial advice to those who were considering the automated road not yet taken. His concerns included:

— How much of the library will be automated?

— Will the system function with more than books?

— Is the system adaptable to online use?

— What types of information will be provided by the system?

— Will the system yield cost information?

— How will the system be evaluated? By cost? By currency and accuracy? By ability to handle increased load? By acceptance of staff and users?

These were certainly reasonable questions for the library manager to consider, and their appearance in the 1967 proceedings confirms that the focus of the management of automation was on the system itself, not on the people. But the two articles in the 1967 proceedings must be considered anomalous. Management issues were not to take a prominent position for some years to come.

Other management articles did appear sporadically. For example, T. C. Dobb (1970) from the Simon Fraser Computer Centre in British Columbia wrote on the organization of data processing for the library from the perspective of the computer center. Perhaps his most salient observation was that, when it comes to automation, the organizational structure was not as important as the people selected to fill the positions within that structure. It was vaguely reminiscent of the battle in organizational theory between sociologist Max Weber, who emphasized rational bureaucratic structure, and management theorist Douglas MacGregor, who emphasized the importance of human motivation. Does a rationalized bureaucratic structure provide maximum productivity, or does the "right" employee provide the needed productivity regardless of the structure? On this issue, Dobb had an international inspiration. He crystallized his thoughts by modifying what he called an old Chinese proverb:

> If the wrong people are in the right structure, the right structure will work in the wrong way; but if the right people are in the wrong structure, the wrong structure will work in the right way. (p. 80)

Dobb does not say where he found the original version, nor what the original creator would have thought of this adaptation. But the message was clear: the people were critical.

The reason why articles on the management of automation were sporadic in the early years of the proceedings may have been a natural outgrowth of the incipient character of library automation. Drawing from the work of Henry Lucas, John Olsgaard (1985) from the University of South Carolina has suggested that the literature of computer systems, indeed the development of the discipline of computer systems itself, follows a linear progression: first are considerations primarily involving technological or physical issues (the machine); second come organizational considerations (the structure); and third are considerations related to organizational behavior (the people) (p. 20).

That the proceedings would reflect this linear progression is logical. The early proceedings concerned themselves with technological problems of the machine. These were the problems immediately confronting the library decision-maker. Discussion of the organizational structure and the management of people would have to wait until the manager

had implemented automation and discovered the human problems that lay in ambush. A reservoir of managerial experience was necessary before it was possible to create substantive generalities in these areas.

PHASE II. ORGANIZATIONAL CONSIDERATIONS

Proceedings of 1976-78

The proceedings from 1976-78 reflect the evolution of management concerns from the technical aspects of the machine itself to the organizational issues affected by the implementation of automation. Three basic management topics were reviewed over these three years of the proceedings: the economics of automation, contract negotiations, and causes of failure in library automation. In each case, one common characteristic is manifest: time—time to gather economic data, time to fall victim to vendors, time to experience the agony of technological defeat. It should be noted, however, that even now the discussion focused on the effects of the machine on the organization rather than the effects employees had on the organization.

The 1976 proceedings was devoted to the economics of library automation. As might be predicted, part of the economic picture involved the ubiquitous assertion that computers could reduce labor costs. A stimulating article entitled "The Economics of Library Computerization" described the fiscal threats that had descended on the library, and proposed the use of "scientific economics" as a tool for assessing library automation (Kilgour, 1976). Kilgour observed that despite the fact that libraries were being managed well, they were in financial peril. This peril arose because costs were rising, including staff costs, and a substantial portion of library patrons were failing to get what they wanted from their libraries. Increasing costs and decreasing service is, of course, exactly what a manager does not want to hear. That automation provided perhaps the only means for ameliorating the situation seemed obvious. Among the labor-saving areas noted were:

— automation increases the amount of work done,

— computers can substitute for human effort,

— computers are faster than humans, and

— computers allow for automatic detection of error. (p. 6)

Kilgour further argued that economies of scale, especially in such

areas as shared cataloging, were particularly appropriate for computer application. His closing statement was a clarion call to the reluctant library manager still percolating over the question: "Should I or shouldn't I automate?"

> It is all too clear from economic analysis that libraries have extremely serious problems to be solved. There is no way that society is going to support a 460 percent increase in financial support for an institution experiencing a 50-60 percent failure rate in service. Libraries are as efficient as other labor-intensive service industries, and it is impossible to see how any further increase in the efficiency of an already highly efficient operation can cope with such rocketing increases in costs. It is inevitable that a drastic change must occur in library operations; for the immediate future, the greatest desirable impact will come from computerized, on-line networking that provides not only labor-saving functions but also effective economies of scale. (p. 9)

It is a perplexing paragraph. How can libraries be called "highly efficient" yet be unable to provide satisfactory service 50 percent of the time? One detects overstatement and flattery in the claim of efficiency. Despite the opacity of the reasoning, the basic argument—that libraries face fiscal threats and threats to productivity—is clear.

Interestingly, however, the majority of articles in the 1976 proceedings do not focus on the theme of labor savings. Rather, attention is focused on the costs of various processes. These include costs of system design, computer supplies, and support; cost analysis of automating technical services; the economics of book catalog production and catalog conversion; cost analysis as a basis for decision-making; and the economics of automated circulation.

Only the passage of time could have made the 1976 proceedings possible. Experience with automated systems, especially in universities such as Ohio State and Cornell, as well as in cooperative enterprises such as OCLC, formed the empirical base for this level of managerial analysis. Without such experiences, talk of the economics of automation would have been only idle speculation.

But the newly automated library organization was not only concerned with internal costs. The outside world also presented its own fiscal threats and constraints. This was particularly true in the area of negotiating contracts with vendors. So it was that the 1977 proceedings devoted itself to negotiating for library automation.

The threat of poor negotiation was obvious: the price tag for automation was, and is, sufficiently high to threaten the fiscal viability of the institution and political viability of its director. In a way, the high price of automation had made library organizations acutely aware that they were, in fact, an open rather than a closed system, and that there were dramatic external factors that affected their production and

survival. If management is the art of control, then attention would now have to be directed to controlling this uncertain environment. The "art of haggling" was given new meaning and importance, a new level of sophistication was required, and literature had become necessary to promote this sophistication.

J. L. Divilbiss (1977) noted that librarians still considered themselves at a disadvantage when negotiating for automation services for three reasons: one, the product and service were technically complex; two, the legal instruments were mysterious; and three, the vendor was a good deal more experienced in contract negotiation than the librarian (p. 1).

In this proceedings, the librarian learned the art of negotiating contracts with regional networks, automated circulation systems, and online data base services. The 1978 proceedings on failures in library automation offered an entirely new organizational dimension to the evolution of management concerns. Here, for the first time and in one place, managers could find out what mistakes others had made. This was, as issue editor F. W. Lancaster (1978) noted, "the other side of the coin." He reassured his readers that "it is perhaps not too surprising to find that the most abject failures are attributable more to management ineptness and bureaucratic bungling than to inadequacies in existing technology" (p. 1).

From a managerial perspective, it is hard to be reassured by this apologia for technology. But this harsh judgment was no doubt substantially accurate, and was a tacit recognition that Dobb's 1969 modified "Chinese proverb" was right: If the wrong people are in the right structure, the right structure will work in the wrong way.

But the litany of failure in the 1978 proceedings revealed not only the incompetence of managers. It also revealed the deficiencies of bureaucracies and the folly of believing unrealistic promises. Several articles, for example, discussed difficulties in dealing with governmental bureaucracies. One even listed twenty-eight steps that the state of California required the university to follow in order to purchase anything "even smelling like computers." Step 28 in this list of steps was: "Repeat steps 22 through 28" (Kountz, 1978, pp. 26-27).

James Corey (1978) from the University of Illinois at Urbana-Champaign discussed the organizational trials and tribulations of trying to develop an automated circulation system for the undergraduate library. He identified several traps into which the unsuspecting manager could fall. These included:

— not obtaining firm fiscal commitments from the administration,

— not obtaining enough money to get the system to the appropriate operational level,

— territorial conflicts among developers,

— taking too long a time for development,

— lack of understanding of the functions of the system, and

— developing a system that is too complex.

Corey's article highlights the need for reality orientation when buying into automated systems. The management of an automation project requires considerable attention to several factors requiring budgetary, political, and technical acumen. Most of general management can be a hit-or-miss process. Even when mistakes are made, there are often time and opportunity to correct them with minimal inconveniences. But it becomes painfully clear in reading the 1978 proceedings that automation projects take on a momentum very early in the development stage which, if improperly directed, can result in considerable and not easily reparable human and fiscal costs. There is a need for meticulous planning from the start by a realistic manager.

The realities of automation may be hard to grasp at first. Allan Veaner (1978) warns about the differences in actual and promised characteristics of automated systems development. He counsels the manager to beware of promised versus actual schedules, promised versus actual costs, and promised versus actual performance.

As a trilogy, the 1976-78 proceedings covered subjects of considerable contemporary interest: economics, contract negotiation, and reasons for failure. Discussion of these subjects formed a natural foundation for the evolving discussion of the relationship of automation to organizational behavior.

PHASE III. THE PROCEEDINGS OF 1983 AND 1985

The 1983 proceedings on competencies in library automation was a recognition that developing technologies had had a profound effect on library personnel. New technologies had stimulated the creation of new types of jobs and the evolution of old ones. The proceedings confirmed that sociological forces were at work, transforming the occupation of librarian to that of information professional. In the words of the clinic's editor, the 1983 proceedings considered "how professional

roles and responsibilities have been and are being affected by technological change and what competencies are important in filling these roles" (Smith, 1983, p. 1).

Certainly, these were appropriate times to be asking such questions. In addition to the direct changes occurring in the information professions, more general developments in labor relations had created a definite need for clear definitions of the required knowledge, skill, and ability that should be possessed by workers. Equal employment opportunity court decisions were unambiguous in their assertion that individuals were to be judged on how their specific talents matched those required for a specific job. It should be noted, however, that the 1983 proceedings was not directed toward the practical managerial areas of job analysis or personnel selection; rather, it was a broader sociological study of how technology had changed the occupation of librarian.

The key questions for the 1983 proceedings were identified in an article by Jose-Marie Griffiths from King Research, Inc. She queried: "What are the current major trends affecting the library and information environment? . . . What do information professionals do? . . . What competencies are currently needed by information professionals to perform their functions and activities? What new competencies will be needed?" (Griffiths, 1983, p. 6).

Griffiths noted that information professionals now served in a wide variety of organizations, from libraries, information centers, and clearinghouses to database producers and distributors; from special collections and archives to information analysis and records centers. Providing a competent work force for these various agencies represented a substantial challenge. She argued that there must be cooperative planning between at least four groups: the information service organizations, education and training agencies, members of the research community, and professional societies.

Underlying this concern for competencies was an uncomfortable question: Do old librarians need new skills, or are completely new workers needed—a "new breed" of information professional? The notion is disquieting and strikes at the heart of not only the librarian but also the library school. Do library schools need new courses, or are completely new and different library schools needed?

Kathryn Luther Henderson (1983), writing on new competencies for technical services, found that what was needed for the future were librarians who were:

> . . . thinkers (with analytical minds), problem solvers, decision makers, and leaders . . . [they] must be inquisitive, curious, imaginative, and creative—they must be capable of managing, organizing, supervising, and communicating. And, at this particular time, the message that

> comes through is that they should be adaptable and flexible persons amenable to change . . . (p. 36)

By any standard, this is a librarian *par excellence.* Is this a new breed, or a refurbished version of the traditional librarian?

Danuta Nitecki (1983) from the University of Maryland Libraries, writing on new competencies for the public service librarian, noted that the librarian was being transformed into the "information consultant" or "information specialist" (p. 55). Richard Sweeney (1983), then Executive Director of the Columbus and Franklin County Public Library, seconded this chorus of rebirth and transformation. He exhorted that "librarians should not and must not be defined by a place—i.e., a library or even by a type of media such as the book" (p. 59). And Evelyn Daniel (1983) applied the *coup de grace* to the traditional librarian by reminding all that the profession is not one of librarianship but of "information professional" (p. 97).

It is a stimulating proceedings imbued with the assumption that new technology is here to stay, that it constitutes the defining environment for job analysis, and that people must adapt to technology's beneficence. Attention had shifted from the management of technology to the management of people. Only one article in the 1983 proceedings acknowledges the disruptive power that humans have over machines. Carolyn Gray (1983) from Brandeis University Library warns that optimism with automation must not ignore this power. The root of the problem, according to Gray, is that workers feel politically subordinated to the automated system. Failure to involve staff in the planning and decision-making process disenfranchises and can lead to sabotage—to what Gray refers to as "a new generation of Luddites" (p. 71).

Sufficient time had passed in the management of automation to know that people can be a major impediment to technological innovation. It is not surprising, then, that only two years later, the proceedings was entitled *Human Aspects of Automation: Helping Staff and Patrons Cope* (Shaw, 1985). This edition was in large part devoted to the management of people. It reflected the notion that organizational behavior had become a primary focus of automation management, and as such it was an index of the maturation of the discipline and its literature.

In this volume, major personnel issues that face managers of automation were examined. Topics such as "Resistance to Change," "Ergonomics," "Staffing," and "Planning and Implementation" were reviewed.

Why is it that people resist the machine? Sara Fine (1985), a psychologist whose research focused on human resistance to automation, reported that resistance is "alive and well among approximately 20

percent of our staff." (p. 4). Echoing Carolyn Gray's concern, Fine noted that human alienation results from attending to the computer, and this alienation is amplified when the decisions regarding automation are perceived as beyond human control. The result of such alienation is frustration and anger, which in turn produces apathy, sabotage, and employee turnover.

Of special significance in Fine's remarks, however, is the observation that resistance to automation can be a positive factor. It is probably not difficult for managers to remember a time when they wanted to institute a change, and there was at least one nay-sayer who kept pointing out one problem after another. It seemed a type of guerilla warfare, an attempt to wear managers' convictions down.

But the nay-sayer had raised some good points, which taken seriously and listened to might uncover potential problems which could be resolved before instituting the change. Resistors, according to Fine, provide a safeguard to the institution. The resistor must be respected and talked to rather than dismissed and ostracized.

It is an observation much appreciated by employees whose criticisms are often reduced by managers to the charge of provinciality or narrow-mindedness. But, although this is good advice for the manager, it has a ring of simplicity and näivete. It is like many management texts that talk about staff communication but say nothing about staff who simply will not listen. Neither Fine nor anyone else has an answer to that problem. Despite its flaws, Fine's perspective is refreshing and promotes respect for dissent.

Marvin Dainoff (1985) from the Center for Ergonomic Research explored another vexing area for the aspiring automator in the 1985 proceedings: ergonomics. Dainoff defines ergonomics as "an applied science concerned with the fit between people and the things (tools, equipment, environments) that people use" (p. 17). More commonly, it is the study of how technology affects the physical and, to a lesser extent, the psychological well-being of the worker. The potential physical damage from automation appears to be endless: backaches, neckaches, headaches, eye strain, and damage to the muscles of the arm and hand from inflexible chairs, improperly adjusted keyboards, and glaring Video Display Terminals (VDTs). Added to these are potential electro-magnetic dangers from VDTs. It may prove safer to live next door to a nuclear power station than to input OCLC records in one's local library! What is clear is that, in the current litigious climate in which any form of physical damage to the worker is subject to a claim of employer negligence, the area of ergonomics has become a necessary business of the automation manager.

The focus of both Fine and Dainoff is on the individual worker.

Fine deals with the domain of the mind, Dainoff with the domain of the body. But another issue for the automation manager is knowing what organizational factors are affected by automation, and how these factors affect the behavior of library workers. A useful overview and summary of these issues is given by Margaret Myers (1985):

1. *Staffing patterns:* Myers noted that the traditional separation of technical and public services functions was blurring. Automation had brought together files that were once physically separate. This blurring had created fuzziness to what used to be clearly defined work roles and work places among public and technical service employees. Such fuzziness could have serious effects on worker behavior. Research has suggested that high levels of role ambiguity can produce reductions in job satisfaction. In contrast, if the blurriness is perceived by employees as an opportunity for variety and challenge in the workplace, it can increase satisfaction. The current state of knowledge on this subject, as Myers notes, is imperfect. This leads to the second area identified by Myers, job analysis.
2. *Job analysis:* The introduction of new technologies, as noted earlier, has changed the nature of many jobs. This, in turn, affects job classification, and wage and salary structure of the organization. The challenge for the automation manager is to assess the impact of these changes on job classification. It must be remembered that reclassification may be perceived by the manager as a fruitful exercise in organizational rationalization, but may be perceived by the employee as an activity inclined to produce stress and conflict. In unionized environments, the potential misperception could be explosive.
3. *Professional support staff dynamics:* Myers notes that automation has freed some professionals from technical and clerical routines, and that these have been transferred to support staff; similarly, as professionals perform more sophisticated technological feats in automated searching, support staff have been allocated the additional responsibility of answering basic reference questions. Further, support staff are acquiring technical expertise not necessarily possessed by the professional librarian.

   How do these changes affect both the formal and informal relationships of professional and support staff? How are the authority and responsibility roles being redefined? Given that even in traditional libraries, professional and support staff relations are easily strained, will these new changes increase the status differentials or decrease them? Will a new organizational

equilibrium be established? There is simply not enough information as yet to support an intelligent generality.

4. *Training:* Failure to train properly is a common problem that can produce devastating results for the organization and for the employee. However, it appears that, in the area of automation, library managers have recognized the seriousness of the issue. Myers notes that a study of 300 automation projects revealed that 50 percent of the costs incurred were for training. She warns managers not to underestimate the time required for staff to become acclimatized to new technology. It is good advice. Employees who fear that they are unable to learn or perform new tasks can produce resistance to change.
5. *Performance evaluation:* An effective system of performance evaluation must be based on sound information concerning the employee's performance. Automation has affected performance evaluation of the employee in an interesting way: it can provide what appears to be "objective" information. For example, in technical services, the number of items catalogued or processed by a particular employee can be determined. Similarly, the work of an employee can be checked against national or local standards to determine quality as well as quantity of work performed. The dark side, however, is that such monitoring by the supervisor could be interpreted as surveillance rather than supervision, and this could have serious impact on stress and morale factors in the organization.

CONCLUSION

The twenty-five years of proceedings, taken as a whole, reflect the recognition that library organizations are complex. The content of these proceedings reflects a logical progression from concern with the machine to concern with the human. There still remain, however, some deeper philosophical issues that have yet to be explored from a manager's perspective. Most notable is the issue of effectiveness. Is library automation real progress? David King (1986) recently argues that much of library automation may be "halfway technology," too costly and too complex to adequately solve the true problems of the library users, and that it may substitute problems that are defined and therefore more easily solved by the technology itself. Perhaps such philosophical speculation constitutes a fourth phase in the evolution of concerns for library management.

For the library manager, the development of automated systems

has been both an occasion for celebration and a cause for trepidation. Today, as in the past, automation is considered to be an important new factor in the workplace. As a result, managers are still experiencing growing pains among staff and in organizational structure. In terms of the evolution of automation, managers may soon advance to a new stage—a stage in which automation will become less important and less significant because it will have been around a while. If a library has had an automated circulation system and an on-line catalog for ten or fifteen years, perhaps when that system is improved or changed the effects will be much less dramatic. Personnel will have accommodated, ergonomic factors will be considered as a natural part of change, and managers will know what to do before they do it. In this regard, the proceedings of the data processing clinics have contributed and will continue to contribute to that body of knowledge that will make these transitions smoother and more effective.

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